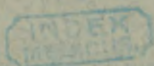
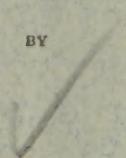


McBride (J. A.)

AUSCULTATORY PERCUSSION

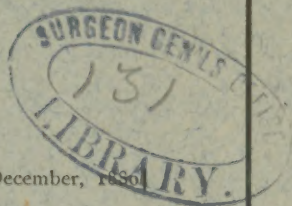


BY



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PHYSICIAN TO THE OUT-DOOR DEPARTMENT OF THE NEW YORK HOSPITAL



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AUSCULTATORY PERCUSSION.

By T. A. McBRIDE, M.D.,

PHYSICIAN TO THE OUT-DOOR DEPARTMENT OF THE NEW YORK HOSPITAL.

IT is difficult to measure with any great degree of accuracy the extent of the outward surface presented by the several organs of the body by the methods commonly employed. I believe that it may be safely asserted that the practitioner does not attempt the measurement of the presenting surface of the heart, liver and spleen, except when very much increased or diminished in extent. In fact, measurements in centimetres or fractions of an inch are usually essayed only by the consulting expert or by the lecturer in the amphitheatre in the presence of students, and how often the measurements announced are at fault the post-mortem records abundantly testify. It is not to be denied, however, that some few are so expert as to be able to accurately outline the boundaries of many of the organs of the body, but this accomplishment is obtained only by long experience and constant practice and by the exercise of the greatest care and patience. The method which has been most commonly employed has been that of mediate or immediate percussion, but since errors in the measurement of the presenting surfaces have been so frequent other methods have been proposed.

Dr. Griffith (*Lancet*, vol. ii, 1871, p. 848; vol. i, 1872, pp. 42 and 494) has suggested that a thin bow of steel,

with the ends connected by a taut catgut, might be used for differentiating subjacent parts of differing density. The catgut is made to vibrate, and the arch of the bow is then placed successively on different parts of the surface of the body, and as it is placed over an organ or viscus of dense consistency or the reverse, a change in the intensity, pitch and quality of the vibrations may be observed. It is known as the diapason. Dr. Herman Baus ("Phonometrische Untersuchungen der Brust und des Unterleibes," *Deutsches Archiv für Klinische Medicin*, vol. xi, p. 9, 1872) has invented for this purpose the phonometer, which consists of a tuning-fork fastened to a narrow base of metal, so narrow that it can be placed in the intercostal spaces. The principle of its action is the same as the diapason. The dimensions obtained by the diapason and phonometer are invariably smaller than the actual measurements made post-mortem, and the outline cannot be defined so sharply as to prevent a great source of error in the hands of different observers. The resonator of Gerhardt (*Lehrbuch der Auscultation und Percussion, mit besonderer Berücksichtigung der Inspection, Betastung, und Messung der Brust und des Unterleibes zu diagnostischen Zwecken*, 3d edition, Tübingen, 1876; pp. 81, 116, 161 and 272) and the sensitive flames of Wintrich (*Einleitung*, p. 44) demand but a passing notice since they are applied in the same way and act on the same principle. It is not likely, therefore, that these methods will be adopted.

In 1840 Drs. Camman and Alonzo Clark, of this city, published some observations in the *New York Journal of Medicine and Surgery*, for July of that year, on a method for the determination of the extent of the outward presenting surface of certain organs and viscera of the body. This method was a combination of auscultation and percussion applied by the aid of a peculiar stethoscope and to this

method they gave the name of "Auscultatory Percussion," and it has always seemed to me, in view of the extremely accurate results which Drs. Camman and Clark obtained by this method, that a sufficient prominence had not been given to it in the practice of the day; and the object of this paper is to call attention to this method, and to a modification of the stethoscope which will enable any one to apply it individually and unassisted and without difficulty, since the success and utility of every method employed in observation depends greatly upon its simplicity and readiness of application. Before entering upon the consideration of the particular method of Drs. Camman and Clark, it will be well to briefly refer to some methods which have been suggested for the diagnosis of certain pathological lesions accompanied by changes in the density of organs, and for the estimation of the extent of the presenting surface of organs, to which the name of auscultatory percussion or synonymous terms have been applied, since the same principle is involved in all of them.

Roussel (*Revue de thérapeutique médico-chirurgicale*, 1er juillet, 1876) and Guéneau de Mussy (*L'Union Médicale*, 3d serie, 1876), under the title of "Auscultation Ples-simétrique," called attention to auscultatory percussion, practised by percussion over the dorsal spines while auscultation was made over the front of chest, and the reverse percussion being practised over the clavicles, sternum or thorax, while auscultation of the posterior surface of the chest was made. By this method slight degrees of consolidation and enlargement of the bronchial glands were appreciated, which otherwise might easily have been overlooked.

Zuelger (*Berlin. Klin. Wochenschrift*, 43, p. 636, October 22, 1877) also called attention to a method of determining the presenting surface of the heart in [which percussion

was made over the præcordia while an assistant auscultated the left posterior surface of the chest.

Lücke (*Archiv f. klinische chirurgie*, von Langenbeck, t. xxi, fasc. 4, p. 838, 1878) directed attention to auscultatory percussion as an aid in the diagnosis of certain affections of the bones, and of fractures where slight or no displacement has occurred.

Hueter (*Centralbl. f. die medicin. Wissenschaften*, Nos. 51 and 52, 1878) has contributed to the same subject, employing the microphone or stethoscope of Voltolini.

In the method of Drs. Camman and Clark the stethoscope was a solid cylinder of finely-fibred wood, shaped in the direction of its fibres, about six inches in length and some ten or twelve lines in diameter. At one end was the ear-piece; at the other the instrument had the shape of a truncated wedge, so that it could be applied in the intercostal spaces without touching the ribs. The instrument was applied in the following way: The ear end was accurately fitted to the ear, and the wedge-shaped end was applied firmly and evenly over that portion of the organ to be examined which was most superficial and was not covered by any of the adjoining organs or viscera. Percussion was then made from some distance from the stethoscope toward it, and a change in the intensity, pitch, and quality of the percussion note answered to the density of the subjacent organ or viscus. The authors claimed for this method:

1st. "That the heart can be measured in all but its antero-posterior diameters, under most, perhaps all circumstances of health, and disease, with hardly less exactness than we should be able to do if the organ was exposed before us."

2d. "That the outlines of the liver can be traced with much greater certainty than by ordinary percussion in cir-

cumstances of health ; and that it can be circumscribed in many conditions of disease in which ordinary percussion is not applicable."

3d. "That the dimensions of the spleen can be ascertained in circumstances that baffle ordinary percussion."

4th. "That by it we can mark the superior, inferior and external limits of the kidneys. Ascites presents no obstacle to the measurement of these organs, and from enlarged spleen the left kidney is easily distinguished."

Dr. Clark, in his lectures at the College of Physicians and Surgeons, states that in these investigations the limits of presenting surface of the heart were marked out by long needles thrust through the anterior wall of the thorax, and that it was the rule to find that the needles had passed through the pericardial sac by the side of the heart, or had just penetrated the edge, so to speak, of the heart.

Such accurate measurements having been made, it would seem that the method would have been generally adopted and commonly employed. The explanation of its not having come into common use since the demonstration of its value is, that two persons were necessary in the practice of the method,—one to practise auscultation, and an assistant to make the percussion.

In 1871 I observed Dr. John T. Metcalfe use the ordinary binaural stethoscope of Camman to outline the limits of a large liver by auscultatory percussion. The pectoral extremity of the stethoscope was placed over that portion of the liver which extended below the free border of the ribs, and percussion was made by the free hand of the auscultator, and the upper and lower borders located. Using the binaural stethoscope in this way, an enlarged liver or spleen, and even the stomach or large intestines, can be very accurately marked out, so long as the pectoral extremity of the instrument is placed squarely over the part to be defined,

and is not in contact with a rib or any substance of greater density than the subjacent part.

Encouraged by the results obtained in defining the abdominal viscera, I had a small, narrow, triangular pectoral extremity, about six millimetres wide, made to fit Camman's binaural stethoscope (Fig. 1). I had hoped to be able to place this narrow pectoral end in the intercostal spaces and avoid the contact of the ribs, but except in persons very much emaciated, and even in them, if placed close to the sternum, I found that this small pectoral end touched the bony parts, and, in consequence, was not to be relied upon.



FIG. 1.

I then obtained a wooden stethoscope (Fig. 2), con-



FIG. 2.

structed by Mr. Ford, of Messrs. Caswell, Hazard & Co., and consisting of two pieces of cedar twigs, with the bark on, which were steamed and bent to the shape of a binaural stethoscope, and with this my two first observations were made. The objection to this instrument was its great clumsiness, though I believe that wood is the best material from which to construct a solid stethoscope. The instrument with which the remaining observations were made is represented in Fig. 3. It consists of two solid pieces of hard rubber connected by a rubber hinge (metal was

first used as a hinge, but it embarrassed the conduction). The pectoral extremities of this solid stethoscope are three millimetres square, and can be placed in the intercostal spaces without touching the tips, and can be brought sufficiently near the sternum without being brought in contact with the cartilages or bones. In proving this method with the modification in the stethoscope, the *modus operandi* was as follows, and I may here mention that the application was made only to the mensuration of the anterior surfaces of the heart and liver.

[In an addendum in a future number of the ARCHIVES, results concerning the method applied to other organs will be given.]

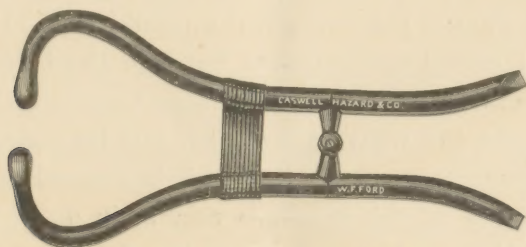


FIG. 3.

In marking out the anterior surface of the heart, the pectoral extremities of the binaural wooden stethoscope were placed over the fourth and fifth intercostal spaces close to the left of the sternum, and percussion was made from the periphery to the præcordia by the auscultator, with closed eyes, by means of the percussion hammer, or index and middle finger of the right hand, indifferently. As soon as a change in the pitch and intensity of the percussion note was observed, the pitch becoming higher and the intensity increased, the spot where this change occurred was marked, and a sharpened knitting-needle, ten inches long, was thrust in at that point. This

was done in each intercostal space of the præcordia to the right and left of the sternum, and in the right mammary line at points which were supposed to correspond to the upper and lower borders of the liver, and also in the mid-sternal line at the point supposed to indicate the lower border of the liver.

1st Observation. *Heart*.—In the second left intercostal space, the needle passed through the left ventricle, at a quarter of an inch from its free border. In the third left intercostal space, the needle passed through the left ventricle at about a quarter of an inch from the border.

In the fourth and fifth left intercostal spaces, the needle passed between the layers of the pericardium. In the fifth, just opposite the apex of the heart.

To the right of the sternum, the needles in the third and fourth intercostal spaces passed between the layers of the pericardium.

Liver.—In the right axillary line, fifth intercostal space and in the right mammary line, fifth intercostal space, the upper border of the liver was accurately defined by the needles; they just passed above it. In the mid-sternal line, and right mammary line, eighth intercostal space, the needles pierced the substance of the liver, and were an inch or more too high.

2d Observation. In this case the heart was displaced very much to the right, by air and blood in the left pleura. Many of the ribs were fractured, and some 800 c. c. of blood were present in the left pleura. I have, therefore, not included measurements of heart in this case. Needles, however, were introduced at the upper border of the liver in the right mammary line, and at the lower border in the right mammary and mid-sternal line, and found to mark out the borders with accuracy, being exactly on its edge, yet not penetrating it.

The following observations were made with the solid rubber stethoscope :

3d Observation. Needles were introduced through the third, fourth and fifth left intercostal spaces, and through the right third and fourth, also through the fifth in the right mammary line, and below the free border of the ribs in the same line, and in epigastric region in mid-sternal line. The needles about the præcordia passed just within the substance of the heart, less than a quarter of an inch from its free border, with the exception of the needle in the fifth intercostal space opposite the apex, which passed through the layers of the pericardium. The needle in right fifth intercostal space passed just through the upper border of the liver. The needles below the free border of the ribs were found to be an inch from the edge of the liver.

4th Observation. Needles were introduced through left third, fourth and fifth intercostals, and on the right side through the third and fourth. The needles on the right side and at the apex passed through the pericardium by the side of the heart ; those in the third and fourth left spaces entered the substance of the heart close to its left border. Needles passed through the upper part of sixth intercostal space, pierced highest position of the convex surface of the liver, not one-fourth of an inch from the surface. The needles passed through right mammary and mid-sternal lines in right hypochondriac and epigastric regions were more than an inch below the free border of the liver.

It will be noticed that the heart in three of the observations was very accurately outlined, except in observation second, and that was not a proper case on which to test the method ; although, if I had been cognizant of the history, proper precautions in the examination would, I think, have given different results. The upper border of the liver was also accurately defined. Except in the second observation, the lower border was not marked out, but the needles were

an inch or more too low or too high. I believe the explanation of not having obtained accurate results in defining the lower border of the liver is to be found in this, that as the cadaver is placed upon the table on its back, the liver falls back from the anterior surface, or its lower border at least does not closely meet the ribs or abdominal wall, the intestines covering the free border. In the second observation, the ribs and abdominal wall were pressed against the liver, and results were very accurate. If the cadaver had been placed in an erect or sitting position, the liver would have been more closely in contact with the abdominal wall, and the lower border closely marked out. In the living, either in erect or sitting positions, correct results would be obtained.

I believe that by this method the busy general practitioner will be able, by the exercise of some caution and patience, to mark out the heart and liver, and most probably the spleen and kidneys, with a very great degree of accuracy. I have been much surprised at the omission of any notice of this method in many of the hand-books of physical diagnosis, and the slight mention made of it by others. Weil, in his otherwise excellent manual of percussion (*"Handbuch und Atlas der Topographischen Percussion,"* von Dr. Adolf Weil, Leipzig, 1877), only very briefly alludes to it. In this country, Dr. Loomis' work on *"Physical Diagnosis"* is the only one which gives any description of the method and its application. I believe that the method has fallen into disuse because, as formerly practised, two persons were necessary to apply it, and it has been with the hope of calling the attention once more to its great value, and to promote the daily use of the method, that I have devised the instrument which has been described in this paper.

I must thank Drs. Peabody and Delavan, the Pathologist and Assistant Pathologist of the New York Hospital, for opportunities in proving this method by the cadaver.

ARCHIVES OF MEDICINE FOR 1881,

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